REPORT NO. 83-2-2 3430
ALEXANDRIA FIELD OFFICE NOVEMBER 1982

BIOLOGICAL EVALUATION OF SOUTHERN PINE BEETLE ON THE YELLOWPINE RANGER DISTRICT, SABINE NATIONAL FOREST

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REGION 8, STATE AND PRIVATE FORESTRY
USDA, FOREST SERVICE, ATLANTA, GA 30367

SUMMARY

USDA FOREST SERVICE
INSECT AND DISEASE CONTROL PROJECT

TARGET INSECT: Southern Pine Beetle

LOCATION: National Forests in Texas

LAND OWNERSHIP IN TREATMENT AREAS: (Acres)

National Forest: Sabine National Forest
Yellowpine Ranger District

TREATMENT:

Salvage removal, cut-and-leave, ground application of chemical insecticide, Lindane, and pile and burn.

COST: Forest Service $ 7,430

FEDERAL AGENCY FUNDING SOURCE:

KEY ASSUMPTIONS:

Rate of salvage without project = 40% With project = 80%

Stumpage values: Infested $ 70/ MBF; Green $ 150/MBF
Economic justification based on values of salvage and protected volumes during project year.

FINANCIAL EVALUATION

for

National Forests in Texas
(Sabine National Forest)

	@ 4%	@ 7.375%
Losses w/o Project	$ 55,126	$ 51,501
Losses with project	$ 18,375	$ 17,167
Net Benefits with project	$ 36,751	$ 34,334
Project Cost: $	7,430	7,430
Benefit/Cost	4.95:1	4.62:1

ASSUMPTIONS

Primary management objective: Timber

Other management objective: None

Age classes affected: 50 - 70

Rotation age: 70

Average Green Stumpage Price: $150

Average Salvage Stumpage Price: $ 70

% estimated vol. killed that will be salvaged without a project: 40

% estimated vol. killed that will be salvaged with a project: 80

Predicted rate of infestation increase: 1

Estimated Volume Killed is the total amount of volume (including green infested, red infested, and buffer strip trees, but not dead [black topped] trees) that is expected to be killed in 1 year.

Volume Threatened is the additional volume that will be killed as a result of spot growth.

Volume projections are based on standard volume tables.

All immature trees that are protected by a project will not be reinfested, and will be harvested as scheduled.

The area under consideration is accessible.

Markets exist for all benefits claimed.

Inflation is not accounted for.

FPM TARGETS

FOR THE SABINE NATIONAL FORESTS (Southern Pine Beetle) SUPPRESSION PROJECT

	Acres (In M)	Trees Treated (No.)	Vol. Protected (In MBF)	Vol. Removed (In MBF)
I&D Presuppression - Operational Survey . . .	704			
I&D Prevention/Suppression Using Biological Methods				
I&D Prevention/Suppression Using Chemical Methods .				
I&D Prevention/Suppression Using Silviculture/ Mechanical Methods . . .			220	212
I&D Postsuppression Evaluation				
TOTAL				

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by

Wesley A. Nettleton and Michael D. Connor[1/]

Abstract

A biological evaluation for southern pine beetle (SPB) was conducted on 78,261 acres of the Yellowpine Ranger District, Sabine National Forest in Texas. During October 1982, the Yellowpine Ranger District, had an estimated 20 active spots, 57,727 acres of susceptible host type, and 0.34 SPB spots/1000 acres of susceptible host type in the outbreak area. Most of these spots were expanding and there was a large number of green infested trees (green tree:red tree ratio of 8.3:1). Forest Pest Management recommends that the SPB suppression project be continued on the Yellowpine Ranger District.

INTRODUCTION

A biological evaluation was conducted on the Yellowpine Ranger District (RD) of the Sabine National Forest to determine the status of southern pine beetle (Dendroctonus frontalis Zimm.) populations. Entomologists from State & Private Forestry, Forest Pest Management (FPM), Alexandria, LA, Field Office conducted the evaluation on October 18-19, 1982.

In July 1982, a southern pine beetle (SPB) biological evaluation determined that a suppression project should be initiated on the Yellowpine RD (Nettleton et al. 1982). During the late summer and early fall, 165 multiple tree spots occurred on the RD indicating that SPB populations were maintaining an epidemic level.

1/ Entomologists, USDA Forest Service, Region 8, State & Private Forestry, Forest Pest Management, Pineville, LA.

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATION

Aerial Survey and Ground Checks

Standard aerial sketch map procedures were used for this evaluation, except survey coverage was 100 percent. Aerial surveys were conducted by district personnel in September and on October 20, 1982, and spots of red and/or fading trees were recorded and plotted on Forest Service Class A maps. Seven spots were randomly selected for ground checking.

Numbers of vacated and infested trees, brood stage, basal area, age, height, DBH, percentage of the stand in sawtimber, and landform were recorded. This information was used to run the benefit/cost analysis and to hazard rate the stands.

Hazard Rating

All the SPB infested stands were hazard rated at the time of ground checking. This is part of FPM's effort to validate SPB hazard rating systems whenever the opportunity exists. The system used was developed on the Kisatchie National Forest by Dr. Peter Lorio of the Southern Forest Experiment Station. It is designed for use by the National Forests in Region 8 and utilizes field data collected by the prescriptionist during the field procedure (FSH 2409.21d R8 Kisatchie National Forest Supplement No. 7). Due to the similar nature of the forest conditions between central Louisiana and east Texas, we feel that this hazard rating system should accurately reflect host/site/stand characteristics associated with SPB attack on the Yellowpine RD (Lorio and Sommers 1981).

Suppression Project Criteria

Decisions to initiate a SPB suppression project were based on the following criteria:

- Number of SPB spots per 1,000 acres of susceptible host type

  This figure provides an indication of current levels of SPB activity. One multiple tree spot/1,000 acres of susceptible host type has historically been considered the lower threshold of a SPB epidemic. To determine the number of acres of susceptible host type the Continuous Inventory of Stand Conditions (CISC) data for the Sabine National Forest was accessed and number of acres of shortleaf-oak, loblolly-hardwood, slash, longleaf loblolly, shortleaf, and bottomland hardwood-yellow pine were determined (forest type codes 12, 13, 21, 22, 31, 32, and 46). Regeneration, seedling-sapling and sparse stand, acreage was subtracted from the total as these areas have little chance of sustaining large losses to SPB.

- Green tree:red tree ratio

  This ratio, based on the number of green infested trees to the number of red and fading infested trees, provides an indication of how rapidly a SPB spot is expanding at the time of ground check.

- Potential spot growth for the 30 day period following ground check.

  TAMBEETLE is a population dynamics model designed to characterize the growth and dynamics of existing SPB infestations and was developed at Texas A&M University. An interactive version of TAMBEETLE (Turnbow et al. 1982) and a formula developed by Billings and Hynum (1980) were used to predict additional timber loss during the 30 day period following ground checks.

  The number of spots showing additional timber loss and the size of this loss are used to provide an indication of whether SPB losses will continue. Even if a large number of SPB spots occur on a district they are relatively unimportant if projected additional timber losses are small.

- Volume of timber currently infested and economic evaluation

  The volume of timber currently infested is calculated from the ground checked SPB spots. The currently infested volume is used in the Southern Pine Beetle Economic Evaluation Program (SPBEEP) to develop the economic benefit cost ratio, internal rate of return, targets for timber to be removed, and the volume of timber protected by control efforts. As the volume of timber currently infested with SPB increases, the economic benefits from a SPB suppression project also increase.

- Entomological judgment

  Professional experience and field observations from the ground checked spots are used to interpret and supplement the technical data to reach a final decision.

RESULTS AND DISCUSSION

A total of 20 active multiple tree spots were recorded during the aerial survey. Three of these spots were in young pine plantations. Seven spots were ground checked by FPM during the evaluation and the data are summarized in table 1. The ground checked spots ranged in size from 8-143 trees and the mean ratio of green infested:red infested trees was 8.3:1. Most of the spots were expanding and contained many trees with fresh attacks.

Table 1. Summary of ground check data for the Yellowpine Ranger District, Sabine National Forest, October 1982.

Spot No.	Total No. Trees	No. Infested Trees			No. Vacated Trees			% Infested	Green:Red Ratio[a]	Potential Spot Growth[b]	Age	Pine Basal Area
		Total	Green	Red	Total	Green	Red					
1	8	7	5	2	1	0	1	88	2.5:1	Low	90	80
2	48	34	33	1	14	0	14	71	33.0:1	Moderate	65	120
3	68	42	33	9	26	0	26	62	3.7:1	Moderate	70	120
4	99	89	88	1	10	0	10	90	88.0:1	High	77	100
5	70	30	29	1	40	0	40	43	29.0:1	Low	50	80
6	143	83	75	8	60	0	60	58	9.4:1	High	95	110
7	50	41	28	13	9	0	9	82	2.2:1	Moderate	60	90
TOTAL	486	326	291	35	160	0	160	-	-	-	-	-
MEAN	69	47	42	5	23	0	23	67	8.3:1	-	72	100

[a] Based on infested trees only.

[b] This indicates the potential for additional timber loss for the 30 day period following ground check. It was derived by using TAMBEETLE, a population dynamics model developed at Texas A&M (Turnbow et al. 1982), and a formula developed by Billings and Hynum (1980).

Figure 1 shows the area of heaviest SPB activity. There is a total of 57,214 acres of susceptible host type for the entire Yellowpine RD which gives a mean of 0.35 spots/1,000 acres of susceptible host type.

Trend

Of the seven spots ground checked, two have a high potential, three have a moderate potential, and two have a low potential for additional timber loss during the 30 day period following ground checking (table 1).

Economic Analysis

The estimated volume of trees currently infested is 265 MBF. If a SPB suppression project were undertaken, it is estimated that 212 MBF would be removed and 220 MBF would be protected. The volume lost without a suppression project would be 159 MBF and with a suppression project 53 MBF. For detailed information on the economic benefits with and without a project refer to Appendix I.

Hazard Rating

All of the seven infestations rated as high or medium risk to SPB attack. Lorio found on the Kisatchie National Forest that the majority of large SPB infestations occurred in loblolly pine stands that were immature or mature sawtimber, well stocked, and on good sites (90 or better site index). This holds true for the ground checked spots on the Yellowpine RD as table 2 demonstrates.

RECOMMENDATIONS

Based on the size and number of new spots found this late in the year, the ratio of green infested to red infested trees, and predictions for additional losses, FPM anticipates continued beetle losses next year and recommends a continuation of the suppression project for the Yellowpine RD. A detailed description of control alternatives is presented in Appendix II. (Note: *Cut-and-leave used alone is not an effective method of control from* October through April).

Control efforts will be hindered since local mills are establishing quotas, and spot accessibility will be reduced as rainy winter weather begins. Also, during winter months the beetles disperse, creating new spots that are often not located until trees begin fading in late spring.

If mill quotas remain in effect, we recommend cutting only the buffer strip and infested trees, leaving vacated trees standing. This procedure will control SPB spots and reduce the amount of timber going to markets. The remaining vacated trees will provide some value as wildlife snags.

Figure 1. Location of the heaviest southern pine beetle activity on the Yellowpine Ranger District.

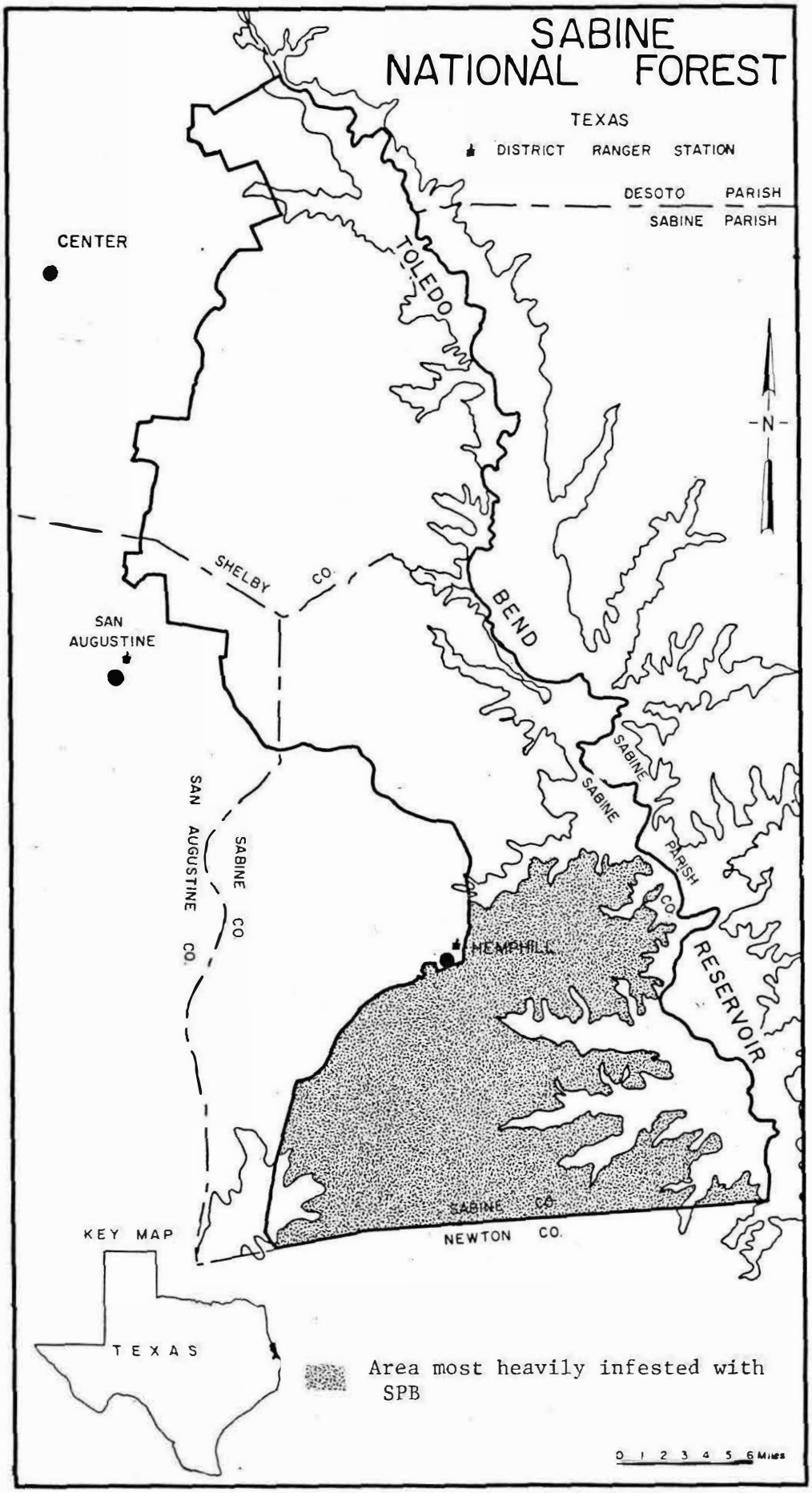

Table 2. SPB hazard rating summary for infestation locations, Yellowpine Ranger District, Sabine National Forest, October 1982.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Pine Species	SPB Hazard Rating[1/]
1	140	80	95	80	16	90	Loblolly	Medium
2	130	120	95	90	16	65	Loblolly	High
3	170	120	128	115	22	70	Loblolly	High
4	130	100	120	105	18	77	Loblolly	Medium
5	140	80	100	100	23	50	Loblolly	Medium
6	120	110	95	70	15	94	Shortleaf	High
7	100	90	90	80	13	60	Shortleaf	Medium
MEAN	133	100	103	91	18	72	-	-

[1/] Based on FSH 2409.21d R8 Kisatchie National Forest Supplement No. 7.

As spots become easier to find next spring, priorities for control should be established using Southern Pine Beetle Fact Sheet No. 3 (USDA Forest Service 1979) or Texas Forest Service Circular 249 (Billings and Hynum 1980). Spots in high and medium hazard stands are more likely to increase in size and should receive priority for removal.

APPENDIX I

Table 3. Southern pine beetle economic evaluation for the Yellowpine Ranger District at 4% discount rate.

WITHOUT A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
50	S/F	14	1.50	22	.7	70	25	$ 150	$ 3731	$ 1637
60	S/F	37	1.50	55	.5	70	58	$ 150	$ 8686	$ 5642
70	S/F	108	2.35	254	.4	70	255	$ 150	$ 38186	$ 36717
TOTAL		159		330			337		$ 50602	$ 43996
								VALUE OF THE VOLUME NOT SALVAGED (LOST)		$ 11130
									TOTAL VALUE LOST	$ 55126

WITH A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
50	S/F	5	1.50	7	.7	70	8	$ 150	$ 1244	$ 546
60	S/F	12	1.50	18	.5	70	19	$ 150	$ 2895	$ 1881
70	S/F	36	2.35	85	.4	70	85	$ 150	$ 12729	$ 12239
TOTAL		53		110			112		$ 16867	$ 14665
								VALUE OF THE VOLUME NOT SALVAGED (LOST)		$ 3710
									TOTAL VALUE LOST	$ 18375

PROJECT BENEFITS:	36751
TOTAL PROJECT COST:	7430
NET PRESENT VALUE:	29321
BENEFIT COST RATIO:	4.95
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	12.23%
TARGETS	
VOLUME REMOVED:	212
VOLUME PROTECTED:	220

Table 4. Southern pine beetle evaluation for the Yellowpine Ranger District at 7.375% discount rate.

WITHOUT A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
50	S/F	14	1.50	22	.7	70	25	$ 150	$ 3731	$ 837
60	S/F	37	1.50	55	.5	70	58	$ 150	$ 8686	$ 3971
70	S/F	108	2.35	254	.4	70	255	$ 150	$ 38186	$ 35563
TOTAL		159		330			337		$ 50602	$ 40371
							VALUE OF THE VOLUME NOT SALVAGED (LOST)			$ 11130
									TOTAL VALUE LOST	$ 51501

WITH A PROJECT

AGE	HARV OBJ.	VOLUME LOST (MBF)	SPOT GROWTH RATE	VOLUME THREAT (MBF)	GROWTH RATE (%)	AGE AT HARV.	VOLUME AT HARVEST (MBF)	PRICE AT HARV.	VALUE AT HARVEST	PRESENT VALUE
50	S/F	5	1.50	7	.7	70	8	$ 150	$ 1244	$ 279
60	S/F	12	1.50	18	.5	70	19	$ 150	$ 2895	$ 1324
70	S/F	36	2.35	85	.4	70	85	$ 150	$ 12729	$ 11854
TOTAL		53		110			112		$ 16867	$ 13457
							VALUE OF THE VOLUME NOT SALVAGED (LOST)			$ 3710
									TOTAL VALUE LOST	$ 17167

PROJECT BENEFITS:	34334
TOTAL PROJECT COST:	7430
NET PRESENT VALUE:	26904
BENEFIT COST RATIO:	4.62
INTERNAL RATE OF RETURN:	> 400%
COMPOSITE RATE OF RETURN:	15.49%
TARGETS	
VOLUME REMOVED:	212
VOLUME PROTECTED:	220

Appendix II

ALTERNATIVES FOR SOUTHERN PINE BEETLE CONTROL

Four alternatives are recommended for southern pine beetle control. The following discussion briefly outlines these alternatives (Swain & Remion 1980). For a more detailed description on conducting control procedures in a southern pine beetle suppression project refer to the Project Control Plan.

Alternative 1. Remove trees through salvage.

Salvage is the method most often used for stopping the growth of existing spots. This strategy involves removing a buffer strip of noninfested trees, all green infested and red infested trees, and if desired, the trees already killed by the beetles. Costs associated with removing uninfested trees are not charged to specifically designated SPB Project Control Funds since removing uninfested material is not needed for successful control even though it may be operationally desirable. The buffer strip should surround the recently attacked trees. It should be 40 to 70 feet wide for most active spots, while a 100-ft strip (and occasionally larger) may be needed for large, rapidly expanding spots. As a rule, the width of the buffer should not exceed the average height of the trees in the spot. The SPB spot should be carefully surveyed and all trees to be removed should be marked.

To implement this alternative the buffer strip should be cut first. All infested trees should then be cut. Vacated trees are cut last and are removed only for utilization purposes. All trees should be felled toward the center of the spot. The reason for this is to keep infested trees as far away from noninfested trees as possible. This reduces the chance of beetles killing additional trees.

Alternative 2. Piling and burning.

Unmerchantable or inaccessible southern pine beetle infestations can be suppressed by cutting, piling, and thoroughly charring the bark of infested trees. The entire bark surface must be thoroughly charred to insure effective control. The order of priority for cutting, piling, and burning infested trees, particularly in large spots, is the same for Alternative 1. Cutting a buffer strip is not recommended. To reduce the possibility of "breakouts", every effort should be made to locate and treat all green infested trees during the piling and burning operation.

Alternative 3. Cut-and-leave infested trees.

This is accomplished by felling a buffer strip and all infested trees toward the center of the spot. The purpose is to stop spot growth. Use of this method causes beetles to disperse at a time of year when this behavior is unnatural. This results in a reduction of mass attacked trees and spot growth ceases. Cut-and-leave should only be used in the summer (May 1 - September 30), since these are the only months beetles are not dispersing. It should only be used on small spots, normally 50 infested trees or less.

Alternative 4. Chemically treat infested trees.

In this method, infested trees are felled toward the center of the spot, cut into workable lengths, and sprayed with lindane or Dursban® 4E. The purpose of this method is to kill the beetle population. To be effective, all bark surfaces must be sprayed. This involves turning the logs which becomes more difficult as tree size increases.

Forest Pest Management, Alexandria Field Office, Pineville, LA, should be contacted prior to the extensive use of chemical control for an update on latest restrictions or application procedures.

PRECAUTIONARY STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in their original containers under lock and key out of reach of children and animals, and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear appropriate protective clothing.

If your hands become contaminated with a pesticide, wash them immediately with soap and water. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove the clothing immediately and wash skin thoroughly. After handling or spraying pesticides, do not eat or drink until you have washed with soap and water.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicide from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agent, state extension specialist or FPM to be sure it is still registered for the intended use. For further information or assistance, contact Forest Pest Management, Alexandria Field Office, Pineville, La., 71360, (Telephone: FTS 497-7280, or Commercial 318/473-7280).

REFERENCES

Billings, R. F.; Hynum, B. G. Southern pine beetle: Guide for predicting timber losses from expanding spots in east Texas. Circ. 249. Lufkin, TX: Texas Forest Service; 1980. 2 p.

Lorio, P. L., Jr.; Sommers, R. A. Use of available resource data to rate stands for southern pine beetle risk. In: Hazard rating systems in forest insect pest management: Symposium proceedings. Gen. Tech. Rep. WO-27. Washington, D.C.: U.S. Department of Agriculture, Forest Service; 1981: 75-78.

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U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

FOREST INSECT AND DISEASE MANAGEMENT PROJECT PROPOSAL
(Reference FSM 3450)

PART I – REQUESTING OFFICE USE ONLY

1. Region/Area	2. State	3. Fiscal Year	4. Causal Agent	5. Group	6. Landownership *(x appropriate box)*
08	Texas	FY 82	Southern Pine Beetle	Bark Beetles	☒ National Forest ☐ Other Federal

7. Type of Project *(x appropriate box)*	8. Status of Project *(x appropriate box)*	9. Host Protected
☐ Prevention ☒ Suppression	☐ New Project ☒ Continuing Project	Yellowpine

10. Prevention/Suppression Method	11. Pesticide	12. Application Rate
Salvage, cut-and-leave, chemical (if needed)	Dursban Lindane	4 lbs. AI/gal. H_2O ½% AI in H_2O

13. Program Activities (a)	First Year Targets and Costs: Units of Work (b)	Unit Cost (c)	Total Planned Cost (d)	Funds Needed in Subsequent Years: FY: Estimated Cost (e)	FY: Estimated Cost (f)
(1) Presuppression-Operational Survey (Acres)	704,350	$ 0.003	2,113		
(2) Treatment (Acres)					
(3) Volume Treated (MBF)					
(4) Volume Removed (MBF)	212	13.62	2,887		
(5) Volume Protected (MBF)					
(6) Post-Suppression Evaluation (Acres)	78,261		1,000		
(7) Environmental Monitoring (Acres)					
(8) Other (Identify)					
(9) Subtotal			6,000		
(10) Indirect and service charges (Field) Percent of Subtotal (15 %)			1,059		
(11) Total Field Costs			7,059		

14. Proposed By *(Signature)*	15. Title	16. Date

PART II – REGION OR AREA USE ONLY

17. Region/Area Indirect and Service Charges Percent of Total Field Costs (5 %)			371		
18. Total Project Costs			7,430		

19. Approved By *(Signature)*	20. Title	21. Project Number	22. Date

PART III – WASHINGTON OFFICE USE ONLY

23. Project Action *(x appropriate box)* ☐ Approved ☐ Disapproved	24. Total Funds Allocated			

25. Approved/Disapproved By *(Signature)*	26. Title	27. Date

28. Remarks

(OVER)